[redacted]

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of Section 255 of the Telecommunications Act of 1996	)	
	)	WT Docket No. 96-198
Access to Telecommunications Services, Telecommunications Equipment, and Customer Premises Equipment by Persons with Disabilities	)	

COMMENTS OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

The Telecommunications Industry Association ("TIA") hereby comments on the Notice of Inquiry ("NOI") in the captioned proceeding, FCC 96-382, released September 19, 1996. Throughout the Association, TIA is committed to effective implementation of Section 255. One of its staff directors is Chair of the Telecommunications Access Advisory Committee ("TAAC"), established by the U.S. Architectural and Transportation Barriers Compliance Board ("Access Board").[1] Employees of TIA member companies are serving as co-chairs of TAAC subcommittees.

TIA has a membership of nearly 600 U.S. companies which manufacture and/or provide communications and information technology equipment, products, systems, distribution services and professional services throughout the world. As an accredited telecommunications standards-setting organization, TIA has ample

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1 NOI, ¶¶ 3 and 4 and note 3.

experience with and substantial faith in the voluntary, industry-led standards process as an effective vehicle to achieve the benefits of Section 255 for persons with disabilities, without unduly burdening affected equipment manufacturers and service providers. In this respect, we applaud FCC Chairman Hundt's statement accompanying the NOI, which says in part:

> The framework we implement should stimulate consultation, cooperation, and voluntary, proactive efforts among the industry and consumers with disabilities to develop "readily achievable" solutions that will bring the benefits of telecommunications technologies to the broadest base of persons with disabilities. Without such a framework, I am concerned that we risk providing the telecommunications industry with a vague and cumbersome mandate that will result in costly and complex complaint proceedings rather than cooperative and innovative solutions. I do not believe Congress intended such a result.

While TIA's member companies not only make the kinds of equipment but also provide the sorts of telecommunications services covered by Section 255, the following perspectives are chiefly those of equipment manufacturers and suppliers to the telecommunications industry.

> As means of oversight, policy statements and guidelines are to be preferred to rules, so long as they provide clear criteria for resolution of disputes.

In Section II of the NOI, the Commission asks whether it should exercise its statutorily-exclusive authority to resolve complaints through case-by-case adjudication, promulgation of a policy statement or guidelines, or FCC rules. TIA recommends, at least initially, that enunciation of policy through statements or

guidelines be the preferred approach.[2] Rules are relatively inflexible and difficult to amend or delete when changes are needed.[3] They pose a higher risk of "freezing" access and adaptive technologies at a time when innovation is most needed.

Moreover, the results from the Access Board will be in the form of accessibility guidelines for equipment. (NOI, ¶4) In its singular responsibility for resolving complaints, the FCC needs to satisfy itself that the Access Board's guidelines are workable, equitable and clear. The Commission can accomplish this by:

- Including the FCC's own analysis and recommendations with the record of this proceeding transmitted to the Access Board;

- Making staff and information available to the Access Board in the course of the Board's processes leading to release of the accessibility guidelines; and

- Conducting its own review of the guidelines following their adoption, and taking whatever steps are needed to make them a suitable basis for informal settlement of disputes or more formal resolution of complaints.

Guidelines are what Congress asks of the Access Board at Section 255(e). They are also consonant with the "voluntary, proactive efforts among the industry

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2 Guidelines as to substance should be distinguished from rules for procedure. Whether complaints are brought under Section 255 or Section 208, the process of filing and hearing them should be set forth with specificity. This does not mean the process must be overly formal; rather, it must be fair and clear.

3 Fixed regulations may also have international consequences. Under Chapter 13 of the North American Free Trade Agreement ("NAFTA"), the U.S., Canada and Mexico included "access" to public telecommunications transport networks and services as one the treaty provisions at Section 1304-1(e). TIA, as the USA Secretariat to the Consultative Committee on Telecommunications, has been advised that this term refers to access by persons with disabilities and includes, for example, the Hearing Aid Compatibility Rules of the FCC. Thus, if the Commission, by rules implementing Section 255, were to expand the scope of access under NAFTA, close cooperation with Canada and Mexico would be required. And the scope of required coordination among governments promises to increase under initiatives such as the Free Trade Agreement of the Americas.

and consumers" recommended by Chairman Hundt and supported directly by TIA and its member companies through contribution of staff and resources to TAAC.

Definitions must be consistent with the use of terms in TA 96 as a whole, and with the ADA where referenced.

In Section III, the NOI asks for comment on several definitions. TIA believes that the definitions of "telecommunications" and "telecommunications service" in the Telecommunications Act of 1996 ("TA 96") are sufficient to attach clear meaning to "telecommunications service provider." We agree with the tentative conclusions of TAAC that "existing definitions of customer premises equipment ("CPE") and telecommunications equipment are sufficient."[4] The definitions are discussed at NOI ¶¶ 9-10.

As to the effect of Section 251(a)(2) -- including as a general duty of interconnecting carriers the obligation not to install features, functions or capabilities compromising accessibility standards -- we note the cross-reference is not only to Section 255 but also to Section 256, whose focus is network inter-operability -- with explicit mention of individuals with disabilities at subsection (b)(2)(B). This suggests Congress intended generally equivalent treatment of network equipment and CPE. However, differences in detail are likely to arise from the practical consideration that users rarely encounter network equipment as directly as they do CPE.

Harmonization of accessibility guidelines (NOI, ¶¶11-12) among different countries is an ideal to be sought continuously in a global marketplace. The present reality is that all manufacturers and distributors operating in more than one

4 61 Fed.Reg. 54612, Monday, October 21, 1996.

country face -- or risk facing -- variable requirements. (Note 3, *supra*) There is, TIA submits, a kind of parity of burdens. Accordingly, we cannot in good conscience suggest that any manufacturer or provider otherwise subject to U.S. accessibility guidelines should be excused from compliance because of the variances in requirements imposed by other countries.

TIA agrees with the NOI's suggestion (¶13) that, despite legislative reference to the Americans with Disabilities Act ("ADA"), the working meaning of disability in Section 255 is narrower than that employed by the earlier statute. We also are persuaded that the second and third terms from the ADA definition -- record of impairment, perception of impairment -- were fashioned largely for use in combating discrimination in employment and public accommodation, and are not relevant to the Section 255 context.

"Readily achievable" should be construed
with ADA precedent in mind, but with
an eye also to the special circumstances
of competition in high-technology industries.

Another cross-reference from Section 255 to the ADA is the term "readily achievable," meaning that barriers to access and use of equipment and services by persons with disabilities are to be eliminated or reduced when this can be carried out "without much difficulty or expense." (NOI, ¶15) TIA suggests that Department of Justice ("DOJ") rules implementing the public accommodations sections of the ADA are helpful in applying the quoted phrases to Section 255 of TA 96. Pertinent here are 28 C.F.R. §§36.104 (defining "readily accessible") and 36.304(b), which lists among modest changes repositioning of telephones, shelves and dispensers, and adding raised markings to control or signalling buttons. Discussing the formulation of these rules at Appendix B to Part 36, DOJ observes that whether any given improvement to accessibility is readily achievable or not is

"to be determined on a case-by-case basis in light of the particular circumstances presented and the factors listed in the definition . . ."[5]

At the same time, TIA respectfully submits that the ADA's employment of "overall financial resources" may be of limited value in Section 255 consideration. This is because innovations and adaptations for special kinds of access to equipment and services -- including access by persons with disabilities -- often depends, in the modern corporate environment, on the imagination and energy of small "intrapreneurial" groups within large hierarchical structures. These groups typically are expected to perform cost-effectively within limited budgets, and to create revenue and profit payoffs from their labor. They cannot expect to be endowed from the larger pools of revenue and profit in their parent enterprises. Accordingly, "overall financial resources" is not a reliable criterion.

Instead, the more meaningful economic measurement is the cost of adding or integrating[6] the accessibility feature in relation to the cost or price of the product or service as a whole. Increasingly, however, feasible pricing is limited by global competitive pressures that drive down margins -- for which one all-too-visible answer has been cost reductions that mean elimination of jobs under such euphemisms as "process re-engineering."

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5 We do not believe that "case-by-case" here should be understood to refer solely to formal litigation of complaints, but to encompass also the informal balancing of benefits and burdens in the wide range of factual settings likely to be encountered.

6 Usually, it will be cheaper to develop the accessibility feature from the outset of design, rather than retrofitting it to existing models. Thus, timing of the improvement -- including the stage of a product design in the product life cycle -- is an important factor in the overall balancing of the equation called "readily achievable." *Kinney v. Yerusalim*, 812 F. Supp. 547, 552 (E.D. Pa. 1993) ("Congress and the DOJ made the determination that when a public entity decides to engage in *new* construction or to *make alterations*, it is not an undue burden to require it to provide for accessibility at that time.") (emphasis added). *See also*, 28 C.F.R. Part 36 (App. B), DOJ discussion of "readily achievable" as converse of "undue burden."

Nowhere will voluntary and collaborative activity between industry and consumers be more important than in the harmonious resolution of issues raised at NOI ¶22. From the manufacturer's perspective, it will be unreasonably difficult, if not impossible, for a single maker to install in every product features that are required for accessibility by all persons having one or more of the covered impairments.

Congress and the ADA-implementing agencies recognized that designing or installing products to address one disability could work to the disadvantage of persons with other disabilities. Thus, DOJ rules provide that some quotient of payphones (*e.g.*, one per floor, if provided on that floor) be of a lower height and otherwise situated for wheelchair access, without requiring all payphones to be so arranged. This means that taller individuals with back problems have ready access, along with persons in wheelchairs.[7]

Similarly as to Section 255, it would be reasonable to expect that some manufacturers will address, in some models, the features required for improved access by persons with a given impairment. More problematic, but still to be hoped, is that the combined efforts of these makers, distributors and installers would result in satisfactory access to all broad types of telecommunications equipment and CPE by persons with every covered impairment. To head off perceived market failures that might result in punitive, counter-productive and innovation-stifling rules, ways must be found to coordinate the consultative process without running afoul of antitrust laws or other legal constraints.

To the extent that not all products will be accessible by persons of every covered impairment, labelling and consumer education are important in guiding users to the models that will satisfy their needs. In this regard, the NOI asks (¶23)

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[7] ADA Accessibility Guidelines for Buildings and Facilities, 28 C.F.R. Part 36 (App. A, §§4.1.3 and 4.31).

for "an assessment of the extent to which accessible telecommunications services, telecommunications equipment, and CPE are currently available." Attached are but a few of many examples:

- A booklet, *Extend Their Reach*, from the Consumer Electronics Manufacturers Association;
- An article, "Maximizing Market Share through Design;" and
- Product descriptions from Ericsson, Motorola and Nortel.

TIA hopes to be able to expand this compilation prior to the close of the NOI record.

Concerning "compatibility" of new equipment with that commonly used by persons with disabilities -- intended as an alternative where adequate access is not readily achievable -- the NOI (¶25) asks for comment on definitions of the terms "specialized CPE" and "peripheral devices." The former has a meaning associated with its use in the so-called "Computer II" rulemakings.[8] The issues for peripheral devices, commonly understood as dependent units separate from but attachable to some main object,[9] are likely to arise in availability, convenience and affordability of attachment.

Enforcement actions must
be concluded promptly
and their outcomes clearly understood.

As noted earlier, the FCC should be prepared to assist the Access Board by (1) providing the Commission's own analysis and

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8 45 Fed.Reg.31364, May 13, 1980, as amended at 46 Fed.Reg 6008, January 21, 1981; 49 Fed.Reg. 1368, January 11, 1984. An example of specialized CPE is the text telephone (formerly "TDD"), defined at 47 C.F.R. §64.601. *See also*, Susan J. Bahr, "Ease of Access to Telecommunications Relay Service," 44 Fed. Com. L.J. 473 (1992)

9 "Peripheral device" is defined at 47 C.F.R.§15.3(r) and includes computer terminals, printers, external floppy disk drives and other data storage devices, as well as video monitors, keyboards, interface boards but not CPU boards) and external memory expansion cards.

recommendations concerning the record created here; (2) working with the Access Board during the development of accessibility guidelines; and (3) reviewing the guidelines, as issued, to determine their usefulness in resolving complaints -- an activity committed by Congress to the sole authority of the Commission. The aim should be to make the guidelines as reasonable, fair and clear as possible, so that the number of complaints requiring resolution will be minimized. As Chairman Hundt has recognized, "cooperative and innovative solutions" should not be suppressed by a "vague and cumbersome mandate that will result in costly and complex complaint proceedings."

Any approach to the FCC should be a last resort. Whether promulgated by the Access Board or the Commission, guidelines should urge that dissatisfied persons with disabilities first take up their grievances with manufacturers or suppliers. Often, this process is facilitated in some fashion by the responsible business entity -- through designated consumer advocates, focus groups and the like. Trade or advocacy organizations have established intermediaries for the purpose of complaint evaluation, functioning in the role of objective ombudsmen.

Should such informal settlement efforts fail, the FCC already is empowered to apply mediation to Section 208 complaints, and the same should be considered for actions brought under Section 255.[10] If adjudication ensues, it should be under a set of clear procedural rules. As an

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10 For the reasons acknowledged in the NOI (¶36), the statute should be read to allow complaints under both Sections 255 and 208. For a survey of mediation successes in the field of disability dispute resolution, see Ann C. Hodges, "Dispute Resolution under the Americans with Disabilities Act," 9 Ad. Min. L.J. Am. U. 1007 (Winter, 1996).

interim measure, the regulations for informal complaints under Section 208 would suffice.[11]

Complaints relating to equipment performance might be obviated or narrowed if some form of manufacturer assurance were supplied for accessible equipment. One model might be the "Declaration of Conformity" adopted for makers and suppliers of personal computing and personal computing peripheral devices.[12] Under recent amendments to Parts 2 and 15 of the FCC's rules, a manufacturer or equipment supplier of these products may test them for compliance with regulations designed to limit radio frequency ("RF") emissions capable of interfering with radio communication. The manufacturer or supplier must then include a declaration of conformity in literature accompanying the product.

CONCLUSION

For the reasons discussed above, the Commission should promote to the Access Board flexible and fair guidelines whose acceptance will be the product of voluntary cooperation between equipment manufacturers and suppliers and their customers with disabilities, rather than the bitter-end outcome of myriad litigation.

Respectfully submitted,

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October 28, 1996

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11 47 C.F.R.§§1.716-717.

12 Report and Order, ET Docket 95-19, FCC 96-208, released May 14, 1996; 3 Comm.Reg. 1 (1996).

CERTIFICATE OF SERVICE

I hereby certify that on this 28th day of October, 1996 a copy of the foregoing COMMENTS OF THE COMMUNICATIONS INDUSTRY ASSOCIATION was served upon the following recipients:

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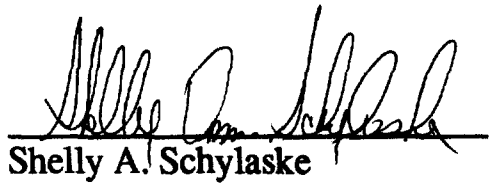

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3/96

In This Pamphlet:

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An estimated 43 million Americans currently live in a world restricted by disabilities. Government statistics tell us approximately 16 percent of the total population has a disability, and as many as one in every three families is forced to deal with a disability. In fact, many would argue that those of us who are able-bodied are simply *temporarily* capable. Three-fourths of those with disabilities are adults, and each year thousands of formerly full-functioning individuals come to experience limitations brought on by aging, accidents or illness.

If you have a disability or would like to assist someone who does, you will be happy to know that there are thousands of specially-designed electronic devices which can assist people with special needs. This pamphlet will introduce you to the types of products available to overcome impairment of sight, speech, hearing, motion, and more. It will also introduce you to some of the companies that manufacture and sell these products, and special sections offer suggestions on funding and how to obtain further information.

What Is A Functional Limitation?

A functional limitation is any physical, mental or sensory condition that prevents a person from caring for himself or herself, communicating, working, playing, or simply functioning in an environment where other people can function normally. Limitations can range from a difficulty in interpreting information, to blindness and hearing loss, to the inability to move all or part of one's body.

Fortunately, functional limitations need not keep any individual, regardless of age or type of disability, from leading a full and productive life. Advanced technology has made it possible for people who are visually impaired and blind to use computers and enjoy TV, for people who are deaf to use telephones and automated telephone services, and for people with physical disabilities to meet the challenges of their environment and become independent and productive.

Assistive Devices Overcome Limitations

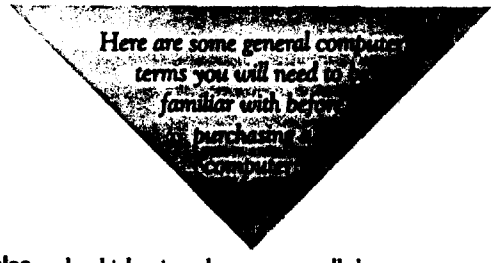
Electronic products which enable people with disabilities to function independently and efficiently at home and in the workplace are commonly referred to as *adaptive* or *assistive devices*. Many aids and systems serve multiple needs and can also be useful to family members or coworkers who do not have a disability. Before purchasing any assistive device, be sure to evaluate the specific needs and abilities of the individual using the device as well as the environment in which the device will be used. See the "Who Can Help" section in this pamphlet for information about professionals who can help you evaluate your particular situation. And remember, you are an equal partner in the evaluation process. The more you tell the professional about your needs and lifestyle, the more likely he or she is to recommend the right solution for you.

General Assistance

Computers

Computer technology has dramatically changed the way we live and do business, and the personal computer has opened doors which have never before been opened to individuals with disabilities. Computers provide access to information and employment, often without leaving home; and portable laptop computers enable even the least mobile individuals to participate productively in the American workforce.

Fitted with the proper assistive devices, computers enable people to communicate without being able to speak or see or hear. They enable them to read without being able to turn pages, to correspond without being able to write, and to work without being able to move.



Cables – *the thick wires that connect all the computer equipment. For example, the cables carry information back and forth from the computer to the printer.*

Compatible – *term used to indicate that the hardware and software can work together.*

Cursor – *a marker which indicates your position on a computer screen. Any activity which you command by using the keyboard will take place at the point where the cursor is located.*

Disk – *a flat square device which contains the information the computer will use. Can be thought of like a musical tape that the computer will "play." Some are called floppy disks because they bend easily.*

Disk Drive – *the part of the computer that translates information from a disk into the computer.*

Electronic Mail – *messages which can be sent electronically from one computer to another. Often called E-mail.*

Hardware – *the computer and all machinery connected to the computer, such as a keyboard, monitor, and printer.*

Keyboard – *the part of the computer that resembles a typewriter. A person using the computer types in the words and issues instructions to the computer by using the buttons on the keyboard.*

Menu – *a listing on the monitor/screen of all the functions you can make the computer perform.*

Modem – *a device which allows one computer to send information to another.*

Monitor – *the part of the computer that resembles a TV screen. This is where your work will be displayed.*

Printer – *the device which prints out the information from the computer onto paper.*

Program – *a set of instructions to make the computer perform certain functions (See Software).*

Processor – *the part of the computer that makes sense of the information going in and out of the computer. (Note: Any assistive device which processes information can be called a processor.)*

Software – *programs that tell computers what to do. If you think of the computer as a radio, think of the software as the radio station which determines what kind of "music" the computer will "play."*

User – *the person who uses the computer (or any other assistive device).*

The following terms refer to assistive devices that can be used with standard computers or substituted for certain parts of standard computers to assist users with special needs:

Communication Aids – *devices which help individuals with speech or hearing impairment communicate with other people.*

Icon Display – *a menu display which uses pictures or symbols instead of words.*

Joystick – *a device that looks similar to a gear shift on a car. Used to control the computer (see Keyboard Emulator).*

Keyboard Emulator – *a control unit that allows someone who is unable to use a standard keyboard to enter information into a computer. A keyboard emulator imitates the computer's own keyboard and performs the same functions. (See Mouse, Joystick and Switch).*

Keyguard – *device that stabilizes the user's hand(s) on the keyboard. Prevents unintentional pressing of more than one key at a time.*

Keylock – *device which allows a user to operate a computer keyboard with one finger, a mouthstick or headpointer (see Physical Limitation section for definitions of these devices). The keylock is similar to the Caps Lock function of a typewriter: the user can depress the key and it will continue that function until the lock is taken off. With a keylock, the user can use other keys without losing the function of the first key pressed. Good for use with the shift, control and alt keys of the computer.*

Moisture Guard – *a device which protects a keyboard from moisture.*

Mouse – *a keyboard emulator that allows the user to move the cursor anywhere on the screen by simply pushing buttons on the control unit or by moving the control unit. Differs from a joystick because a joystick moves the cursor by a rotation movement and a mouse can incorporate additional movements.*

Speech Synthesizer – *enables visually impaired or blind people to use a computer because it "reads" the screen to them with a synthetic human-like voice. Also called Voice Output.*

Switch – *any device which operates another device. Switches that can be used with computers include joysticks, keyboard emulators, pedals, and helmet-like head pieces which translate the user's head movements into computer commands (see the Physical Limitations section for more details).*

Technical Aids – *devices that enable a user with a disability to operate the computer. Examples are keyguards and keylocks.*

Touch-Sensitive Display – *allows the user to operate a computer simply by touching the screen instead of having to use a keyboard or keyboard emulator.*

Visual Cues – *messages on a computer screen that warn the user of mistakes or indicate something that would normally be indicted by sound. Examples are visual indications of errors or electronic mail messages, which would normally be indicated by a bell sound or beep.*

Voice-Activated Commands – *see Voice Input.*

Voice Input – *refers to a computer's ability to accept spoken commands instead of commands entered through a keyboard or keyboard emulator.*

Voice Output – *see Speech Synthesizer.*

Voice Recognition – *a computer's ability to recognize a voice and accept spoken commands and data input.*

Environmental Control

The ability to control lights, appliances, TVs and other electronics is essential to everyday life. Fortunately, certain electronic devices known as environmental control devices or home automation devices can return a sense of independence to individuals who need assistance performing these tasks.

Environmental controls are devices—or networks of devices—which can be attached to electrical and electronic equipment such as lamps, intercoms, TVs and home entertainment products, appliances, drapery, security systems and more. The devices enable an individual to control this equipment within his or her home, hospital room, nursing home or workplace by using a special remote control, switch or computer.

Certain environmental control devices can turn appliances on or off at specified times. Other environmental controls can enable people to turn lights off and on; and still others can enable bedridden individuals to find out who is ringing their doorbell and then unlock the door to allow their visitors to enter.

There are many types of environmental controls available, and it would be wise to speak to an occupational therapist to find out which products might best meet your needs. Remember that there are many switches available to operate these controls, including some voice input systems which allow the devices to be activated by spoken commands. Be sure to choose a switch which is appropriate for the ability level of the person using it. Certain professionals listed in the "Who Can Help" section of this pamphlet can help you evaluate the needs of the person who will be using the switch.

Telephone & Communication Services

Many traditional barriers have been broken down by advances in the areas of telephone services and other methods of communication. Automated telephone services and two-way computer and video communications offer access to banking, travel reservations, shopping, news, weather, and other services without ever leaving home. These services provide individuals with disabilities both independence and privacy in conducting their daily affairs.

The basic terms you should know about these services are:

Automated Attendant—*the voice recording one hears when connected to an automated telephone system.*

Automated Telephone System—*a telephone system integrated with a computer which provides various applications, including recordings of a business's hours of operation, transportation schedules, fees and other types of information. Also capable of routing calls to the appropriate extension without going through an operator.*

Interactive Video Services—*basically the same as videotex, except that users utilize their television sets instead of computers. (See Videotex.)*

Telecommunications—*any form of communication over the telephone network, including ordinary voice conversation and computerized communications.*

TTY Mail—*the same as Voice Mail, except that one sees the message on the TTY instead of hearing it. Also known as "TDD Mail" and "TT Mail" (see page 17 for further information on TTYs, TDDs, and TTs).*

Videotex—*refers to information appearing on a computer screen or video monitor. Certain computerized information services employ interactive videotex which is a two-way communication system allowing people to make travel arrangements, monitor bank accounts, and place orders for merchandise by using their own personal computers.*

Voice Mail—*one application of an automated telephone system which allows a user to remotely send and receive recorded messages when the user is not available to communicate in real time. Whereas a telephone answering device stands alone, voice mail capabilities are built into an organization's telephone system or offered as a consumer service through telephone companies.*

Overcoming Physical Limitations

A physical limitation refers to a change, weakening or loss of normal physical ability. Physical limitations can range from having episodes of fainting or dizziness to experiencing the total loss of control over one's body. More than a million quadriplegics—people who have lost the use of both arms and legs—currently live in the United States. Tens of thousands of Americans become quadriplegics each year due to spinal cord injury, stroke, muscular dystrophy, cerebral palsy, amyotrophic lateral sclerosis and other causes.

Some terms you might hear discussed in connection with physical limitations are:

Incoordination – *the inability to control arms and legs.*

Impaired Mobility – *limitation of movement or range of motion. Can refer to poor balance, difficulty sitting or moving.*

Limitation of Sensation – *difficulty or inability to feel heat, touch, pain or pressure. Refers to an inability of the nerves to function properly.*

Motor Control – *the ability to move and control one's body.*

There are hundreds of specially-designed devices and technologies which can enable individuals to overcome certain physical limitations. Among them are:

Automatic Telephone Dialing – *allows a caller to program his or her telephone to dial frequently-called phone numbers at the touch of a single button.*

Communication Board – *a device similar to a computer keyboard with buttons or squares featuring pictures or words which an individual can point to or press in order to communicate his or her needs or wishes to someone else.*

Dual Switches – *see Switch. Used with technical aids which do two functions. Each switch operates a separate function. For example, pushing one button on the control unit might turn a wheelchair to the left, and pushing a second button on the control unit might turn the wheelchair to the right.*

Head Pointer – *also called headstick. A stick or rod which attaches to a person's head with a band. Allows the individual to perform tasks ordinarily performed by hand or finger movements. Individuals can use head pointers to operate specially-designed computer keyboards or communication aids (see Computer section for definition).*

Intercom – *consists of a master station and one or more remote speakers. Allows for communication between individuals in different parts of a house, nursing home or office.*

Light-Pointing Device – *similar to a miniature flashlight which attaches to the head and allows its wearer to point a beam of light onto a communication board or to objects around him or her. Can also be held in the hand.*

Mobility Aids – *devices which enable physically disabled individuals to move. Example: wheelchair.*

Mouth-Held Page Turners – *mouthsticks equipped with rubber tips designed for gripping pages.*

Mouthstick – *a mouthpiece which serves as a pointer. Allows its user to control a computer, communication board or other device. Also called mouth wand.*

Pointing/Typing Aids – *category of devices which includes headsticks, mouthsticks, hand splints, lightbeam head pointers and other devices which enable an individual to point to objects or press keys on a switch, keyboard or communication board.*

Robotics – *devices which perform movement tasks (reaching, turning knobs, etc.) for physically disabled individuals; artificial mobility.*

Speaker Phone – *a telephone equipped with a two-way speaker. Allows for hands-free use of a telephone.*

Standard Pointer – *a pointer which attaches to an individual's chin.*

Switch – *a device used to control another device. Different switches allow for operation by tongue movement, sipping and puffing, bumping, finger flexing, eyebrow movement, head movement, wrist action and more. Switches can be changed as an individual's abilities or needs change.*

TV Converter – *any regular hand-held TV remote control operated by a special switch.*

Voice Commands – *software which allows a device to accept commands by voice. Also called Voice Input.*

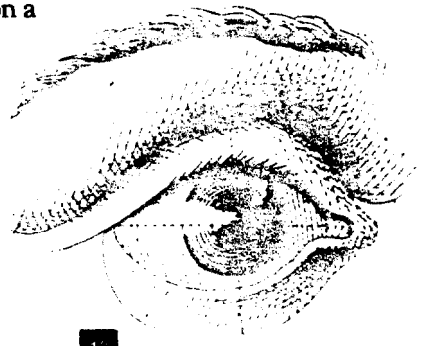
Wheelchair Mounting Kits – *hardware kits used to attach various items to a wheelchair. Can include frames, platforms or brackets.*

Overcoming Visual Limitations

A visual limitation—also called a visual impairment or a low vision problem— is any weakness or loss of a person's ability to see. Visual limitations can range in severity from poor-quality vision to legal blindness to total blindness.

Individuals who enjoy some degree of sight are usually considered to be *visually impaired.* Individuals whose natural vision (without corrective glasses or contact lenses) is below a certain level are considered to be *legally blind.* And, individuals without any ability whatsoever to receive visual information are considered to be *blind.* Any of these three visual conditions may be the result of accidental injuries, cataracts, glaucoma, diabetes, cerebral palsy, multiple sclerosis, or the natural effects of aging.

Advances in technology have made it possible for individuals with visual impairment or who are blind to perform tasks and enjoy accomplishments that have never before been within their reach. Improvements in communication techniques for people with disabilities have been especially important, and by using assistive devices in the workplace, visually impaired adults have easy access to the same information and information processing techniques available to their coworkers with sight. It is now possible for blind workers to perform tasks such as reading, taking notes in meetings, performing word processing and spreadsheet functions on a computer, and much, much more.



Here are some of the many devices and technologies which can assist people with visual limitations to function more productively at home and in an office:

Braille – *a technique whereby each of the letters of the alphabet is displayed in a pattern represented by a combination of one to six (or eight) raised dots.*

Braille Note Taker – *a tiny computer with a braille keyboard and internal digitized memory; used for taking notes in a classroom or meeting. Newest models can hold up to 640 pages of braille.*

Braille Writer – *also called braille embosser and brailler. A device which produces braille letters on paper mechanically. Some electronic braillers, also called braille printers, can be connected to computers to allow blind users to print their computer documents in braille.*

Closed Circuit TV Magnifier – *commonly known as CCTV and also called CCTV reader. System consists of a television camera, which views a printed page or other materials, and a television monitor, which displays the image in larger form.*

Electronic Reading Devices – *electronic devices which "read" written documents using synthetic human-like speech. These devices employ optical character recognition (OCR) capabilities to scan the information on a page and transform it into audible information. (See Scanner for more details.)*

Enlarged Display – *can refer to a computer monitor (see Computer section for definition) which is actually larger than an ordinary monitor, or it can refer to software used to make what appears on the monitor larger. Some enlarged display software can make the information displayed on the screen appear up to 16 times larger than its original size. An enlarged display makes everything on the screen bigger, which means that the user can view symbols and pictures as well as words.*

Large Print Display – *enlarges the letters on a computer screen. Works by "reading" the text off a regular computer screen and reprinting it onto a second screen using enlarged letters. Differs from an Enlarged Display, because it enlarges the letters only, whereas an Enlarged Display enlarges pictures and anything else that appears on the screen.*

Optical Character Recognition – *see Electronic Reading Devices and Scanner.*

Refreshable Braille Display – *a device which displays the characters that appear on a computer monitor as braille characters. Called "refreshable" because it can be used over and over again.*

Scanner – *a device attached to an electronic reading device or a computer. Works like a photocopier to "read" printed material on a page, sending the information either to a built-in speaker which "tells" the user what is written or to a braille display or printing device.*

Screen Enlargers – *see Enlarged Display.*

Sensory Aids – *category of products which assist people overcome visual limitations.*

Speech Synthesizer – *computer hardware and software which enables a computer or other communication aid to "speak" to its user in human-like speech. Includes talking menus, status functions and edit modes.*

Tactile Display – *a display which allows its user to feel the shape of each letter of the alphabet, not braille. Can be used with a computer or a camera-type scanning device.*

Talking Calculator – *a hand-held or desk-type calculator that "speaks" to its user in synthetic human speech. "Tells" its user what functions it is performing.*

Voice Dialing – *a software service that allows a person to pick up a telephone and dial by talking instead of by using the buttons or rotary dial. For example, a person can be connected to the local police simply by saying "police" into the receiver. Each user can design his or her own personal directory of frequently-called or emergency numbers that the device will recognize.*

Note: See Computer section for definitions of Voice Input, Voice Output and Voice Recognition.

Overcoming Hearing Limitations

Limitation in hearing, or hearing impairment, refers to a change in or loss of the ability to hear sounds or spoken words. Some people with hearing impairments experience an overall lower volume in what they hear. Others experience distortions in the sounds and speech that they can hear. Still others have no functional hearing for speech or sounds in the environment.

Individuals who have some hearing ability are usually referred to as being *hard of hearing.* Individuals who have very little useful hearing, and those who get no benefit from amplifying devices such as hearing aids, are usually said to be *deaf.*

Some terms which might be used when discussing hearing limitations:

Acquired Hearing Impairment – *one that first occurs in adulthood.*

Congenital Hearing Impairment – *present from birth.*

Lipreading or speech reading—*a method of communication used by many people who have hearing loss. One person receives communication from another person by watching that person's face and gleaning information from the movements of the mouth and from facial expression.*

Progressive Hearing Impairment – *a condition in which hearing ability decreases over time.*

Residual Hearing – *partial hearing; the amount of hearing ability remaining after an illness, accident or surgery.*

Sign Language – *there are several forms of sigh language used in the United States, including American Sign Language (ASL) and Pigeon Signed Language (PSE). The most common form used is ASL, a visual-gestural language used by the North American Deaf Community. Each individual gesture is called a sign. Each sign has four distinct parts: the hand shape, the position of the hands, the movement of the hands, and the orientation of the hands. PSE is a combination of ASL and manual English. As with spoken languages, signed languages differ from country to country and even within a country.*

Individuals with mild to moderate hearing loss often use hearing aids and other amplification equipment to augment hearing. Among people who do not find amplification equipment useful, visual devices are frequently used. Visual devices can be used for telephone communication, access to captioned television, and for seeing a door-light (rather than hearing a doorbell).

One such visual device is a telecommunication device that sends and receives text messages across telephone lines, between two people who have the same kind of device. Such specialized devices are variously known as TTYs (their original name, which stands for "teletypewriter"), TDDS (for "telecommunication devices for the deaf"), or TTs (for "text telephone").

If both people in a conversation have compatible equipment, they can have a direct conversation. But because most telephones do not have text-telephone devices attached to them, Telephone Relay Services (TRS) were established in each state. The TRS is an operator service that reads the deaf or hard of hearing person's typed message to the hearing party, and types out the words of the hearing person, so that they are accessible to the deaf or hard of hearing party. TRS is a free service that is part of the nation's telephone network.

Some computers can communicate with text telephones. Most text telephones use a code called Baudot, which is incompatible with ASCII (American Standard Code for Information Interchange—pronounced As-key), the standard computer code. However, special products are available that permit the computer to communicate with Baudot text telephones. Standard modems will not perform this function at the present time.

Other devices which can assist people who are hearing impeared or deaf:

Amplifying Telephone Receiver – *a telephone with a volume control built into the hand grip. Allows the user to make incoming conversations louder.*

Assistive Listening Devices – *general name for products that help people hear better. Products include headsets, amplifiers and other non-medically-prescribed listening devices.*

Closed Caption Decoders – *devices which convert a television program's dialogue into text which appears on the TV screen and can be read by deaf and hard of hearing viewers. Starting in mid 1993, all TVs with screens 13" or larger must include built-in closed caption decoder circuitry.*

Compact Personal Amplifier – *a device which increases the clarity and understanding of speech for hearing impaired individuals. Enables the hearing impaired individuals to hear a television, listen in a group, or communicate in a noisy environment without disturbing others.*

Computer-Assisted Notetaking (CAN) – *a system used at large meetings, speeches and presentations whereby the text of the speech or presentation is displayed on the wall using an overhead projector. Involves typing text on a standard computer keyboard.*

Group Listening Systems – *refers to a system of assistive listening headsets and a transmitter installed in a commercial setting such as a movie theater, concert hall or auditorium. Enables many individuals to listen to a movie, speech, concert or presentation at individually-selected listening levels.*

Hearing Aid – *a device worn in the ear to amplify sound. It is important to remember that a hearing aid makes sounds louder but it does not correct other defects in hearing. For example, a person wearing a hearing aid may be able to hear a voice but still may not be able to understand the words being spoken because he or she cannot distinguish between different tones.*

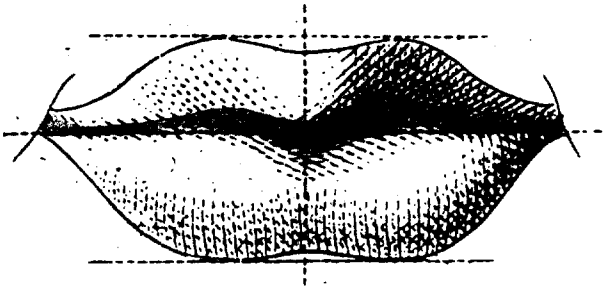
Telephone Amplifier – *a device which increases the sound level, clarity and understanding of speech over the telephone. May be left in place on the telephone without affecting its normal use.*

Telephone Signaling Device – *a device which indicates that the telephone is ringing. May be hooked up to lamps or overhead lighting to cause the lights to flash when the phone is ringing. For use with text telephones.*

Tone Ringer – *telephone device which translates the telephone ring into a special frequency range most hearing impaired persons can hear.*

Overcoming Speech Limitations

A speech limitation—also called speech impairment—refers to a weakening or loss of the ability to speak. An estimated two million people in the United States can hear but cannot speak properly. Various speech limitations restrict these individuals to using only slow, hard-to-understand speech or non-verbal communication such as sign language.



Speech limitations, like other disabilities, vary greatly in severity and cause. They might result from severe language delay, cerebral palsy, mental retardation, autism, traumatic brain injury or stroke. Speech problems can also result from several disorders affecting nerves and muscles, including ALS, dystonia, Huntington's disease, multiple sclerosis and muscular dystrophy. Your physician can help you understand your own particular situation.

People with speech limitations can "talk" to other people by using what is called *augmentative communication*. Augmentative communication refers to ways other than speech that can be used to send messages from one person to another.

Augmentative communication often involves the use of specialized gestures, sign language or Morse code. It might also involve the use of charts, special bracelets, language boards and other devices known as communication aids. The goal of augmentative communication is to restore a person's ability to express his or her needs, thoughts and feelings.

Augmentative communication is made possible through special training, techniques and assistive devices. Remember that communication planning is a life-long process, and the communication aids you choose today may need to be replaced with others in the future.

Here are some terms you will need to know before purchasing any communications aids:

Communication Board – *a device which resembles a keyboard. Uses letters, symbols or pictures to allow its user to communicate his or her needs or wishes to another person.*

Communication Prosthesis – *any device used to communicate in place of speaking or writing. Includes speech synthesizers, switches, special symbols and graphics, voice recognition systems, and more.*

Digitized Speech – *human-like speech produced by a computer or computerized device.*

Electronic Aids – *entire category of devices which enable individuals with speech impairments to have conversations, write and store messages, and have access to computers.*

Speech Synthesizer – *a device which creates computerized "speech."*

Synthetic Voice – *a computerized voice that actually "speaks" for its user.*

Voice Recognition Systems – *devices which allow individuals with some recognizable speech to communicate with computers or other communication aids.*

Who Can Help

. . . with Evaluation

Careful consideration of the needs and abilities of a person with a disability is essential before selecting any assistive device or system of devices. For the names of individuals who can assist you with such evaluation, call your local university, hospital or rehabilitation facility, education agency, or vocational rehabilitation office.

Here are some types of professionals who can help evaluate certain abilities:

Audiologist – *can help evaluate and treat individuals with hearing impairments.*

Manufacturer/Distributor – *manufacturers and distributors of assistive devices can help you understand the possible applications of these devices. They can also often suggest sources for funding.*

Occupational Therapist – *can help understand muscle control of different body parts with and without special equipment.*

Optometrist – *an independent primary healthcare provider who specializes in the diagnosis, treatment and management of diseases and disorders of the visual system, the eye and associated structures.*

Ophthalmologist – *a medical doctor who can evaluate the structure, functions and diseases of the eye. Can perform eye surgery and prescribe medication.*

Physical Therapist – *can help evaluate muscle strength, range of movement, flexibility, balance and coordination abilities.*

Physician – *can help evaluate general health and the appropriateness of medical and surgical treatments.*

Psychologist – *can help evaluate an individual's learning potential, as well as the need for individual and family counseling.*

Rehabilitation Engineer – *can help evaluate the usefulness of customized switches and devices. Might also suggest modifications of equipment used by the general public so that it can be used by an individual with a disability.*

Social Worker – *can help evaluate a disabled individual's total living situation (family structure, finances, etc.). Might also suggest additional community resources.*

Special Educator – *can usually help evaluate classroom and academic performance.*

Speech-Language Pathologist – *can help understand language abilities and interaction patterns, as well as the muscle control necessary for speech. Can provide instruction in how to create the sounds necessary for speech.*

Vocational Counselor – *can help evaluate an individual's potential to hold a job. Can also help identify types of jobs which might be available to disabled individuals using assistive technology.*

. . . with Funding

Assistive devices vary greatly in cost. Some manufacturers of assistive devices offer discounts and rental programs. Always check with a representative of the company whose product(s) you wish to obtain to see if he or she can offer suggestions about financing or refer you to an alternative source of funding.

Certain federal and state health and educational programs often provide funding for assistive devices. Among them are several Technical Assistance Centers (TAC) funded through the National Institute of Rehabilitation Research (NIDRR). Forty-one states currently operate such centers, and the remaining nine states are expected to do so in 1993. Other financial sources might include Medicaid, Medicare, the Veterans Administration, certain union welfare plans, state Crippled Children's services, and state vocational rehabilitation agencies.

Certain non-public sources might also provide funding for assistive devices. Kiwanis, Rotary and Lions clubs are examples. Certain corporate and private foundations also provide funding, as do some insurance companies.

About the ADA

The Americans with Disabilities Act (ADA) has begun to break down many physical and attitudinal barriers traditionally faced by individuals with disabilities. In general terms, the ADA assures equal access to employment, services, transportation, housing, and communication.

While the ADA has focused attention on assistive devices, the Act does not specifically mandate the purchase of such devices. It does, however, mandate that employers, service providers and others make reasonable accommodations to meet the needs of individuals with disabilities. Such "reasonable accommodation" may involve or lead to the purchase of assistive devices.

Contact the following federal agencies for more specific information on ADA requirements involving:

Public Service and Public Accommodations
Contact: Office on the Americans with Disabilities Act
Civil Rights Division, U.S. Department of Justice
(202)514-0301; TT: (202) 514-0381 or 0383

Employment:
Contact: Equal Employment Opportunity Commission
(202) 663-4900; TT: (800) 800-3302 or
(202) 663-4494

Transportation
Contact: Department of Transportation
(202) 663-9305; TT: (202) 755-7687

Accessible Design in New Construction and Alterations
Contact: Architectural & Transportation Barriers
Compliance Board
Phone and TT: 800/USA-ABLE

Telecommunications
Contact: Federal Communications Commission
(202) 632-7260; TT: (202) 632-6999

Information is also available from a nationwide system of regional Technical Assistance Centers (TACs), funded through the National Institute on Disability and Rehabilitations Research (NIDRR). You will automatically be connected to your nearest regional TAC by calling 800-949-4232.

How To Find Assistive Devices

Once you have decided that you, someone you know, or an organization might benefit from an assistive device or series of devices, you will need to know how to go about purchasing the devices. While there are hundreds of companies across the United States which manufacture assistive devices, there is one group which represents several major manufacturers. It is called the Assistive Devices Division of the Electronic Industries Association's Consumer Electronics Group. The group is appropriately headquartered in the nation's capital, Washington, D.C.

The Assistive Devices Division (ADD) consists of private companies of every size that produce electronic and electronic-related products and services which assist individuals with functional limitations and organizations in compliance with the Americans with Disabilities Act. Working together, ADD member companies have created a network to create and sell assistive devices of every kind.

The chart that follows will give you an indication of the types of products manufactured by each ADD company. Each company's telephone number is listed in the chart if you would like to call for further information on a particular type of product manufactured by that company. For general information about ADD companies, you can contact the Electronic Industries Association's Consumer Electronics Group at 202/457-8700. You can also write:

Name Change:
Consumer Electronic Manufacturers Assoc.
(Formerly Consumer Electronics Group)
2500 Wilson Boulevard
Arlington, VA 22201
tel: 703/907-7614 fax: 703/907-7601